Variation (%) in oxygen content = (maximum value - minimum value) / mean value × 100

[0014] The Ti-Nb alloy sputtering target of the embodiment of the present invention preferably has a Vicker's hardness of 400 Hv or less, more preferably 300 Hv or less, and most preferably 200 Hv or less. As the Vicker's hardness is lower, plastic working and cutting work can be facilitated, and the target can be processed into a favorable final shape. And a favorable surface texture yields a superior effect of being able to suppress the generation of particles during sputtering.

[0015] A metal or an alloy to is typically reduces in hardness as the purity becomes higher. Thus, in order to obtain a low-hardness material, it is considered to reduce the amount of impurities by improving a purification technique. However, in such a case, there is a problem that an additional purification process is required and that the production cost will increase. Moreover, oxygen is a gas component and, unlike other metal impurities, there is a limit in the reduction thereof based on a normal purification process. The embodiment of the present invention focuses on the oxygen in the target (raw material), and realizes a low-hardness target by reducing the oxygen concentration as much as possible, even when the target (raw material) has a purity of 4N to 5N.

[0016] The in-plane variation in the Vicker's hardness of the foregoing Ti-Nb alloy sputtering target is preferably within 10%. When the in-plane variation of the Vicker's hardness exceeds 10%, the surface texture may change depending on the location, and uniform deposition may become difficult. In the embodiment of the present invention, the variation in the Vicker's hardness was measured as follows. Specifically, as shown in Fig. 1, the hardness of the respective pieces (0.5 to 1 g) sampled from 9 in-plane locations of the target (1 location at the center, 4 locations positioned at 1/2 the radius on two orthogonal diameters, and 4 locations positioned 10 mm inward from the outer periphery thereof) was measured based on the Vicker's hardness measurement method of JIS Z 2244. The variation in the hardness was calculated based on the following formula.

Variation (%) in Vicker's hardness = (maximum value - minimum value) / mean value × 100

[0017] According to the embodiment of the present invention, the surface

	Composition	Production method	Form and method of adding Nb raw material	Condition of target	Composition range (at%)	Oxygen content (wtppm)	Oxygen variation (%)	Relative density (%)	Vickers hardness (Hv)	Hardness variation (%)	Surface roughness (μm)	Number of particles (0.1 μm or larger)	Heat test result
Example 1	Ti-0.1at%Nb	Melting/ Casting	Ribbon-shaped Nb, added at a time	Favorable	0.09 to 0.10	380	18	100	150	10	0.4	3	No separation and other defects
Example 2	Ti-2at%Nb	Melting/ Casting	Ribbon-shaped Nb, added at a time	Favorable	1.9 to 2.1	350	18	100	180	10	0.4	3	No separation and other defects
Example 3	Ti-3at%Nb	Melting/ Casting	Ribbon-shaped Nb, added 10 separate times	Favorable	2.9 to 3.1	330	17	100	190	8	0.4	5	No separation and other defects
Example 4	Ti-10at%Nb	Melting/ Casting	Ribbon-shaped Nb, added 10 separate times	Favorable	9.9 to 10.2	260	15	100	220	8	0.5	9	No separation and other defects
Example 5	Ti-20at%Nb	Melting/ Casting	Ribbon-shaped Nb, added 10 separate times	Favorable	19.8 to 20.2	200	9	100	360	8	0.7	7	No separation and other defects
Example 6	Ti-30at%Nb	Melting/ Casting	Ribbon-shaped Nb, added 10 separate times	Favorable	29.6 to 30.1	160	6	100	390	7	0.8	6	No separation and other defects
Comparative Example 1	Ti-0.1at%Nb	Melting/ Casting	Square Nb, added at a time	Unmelted Nb, rolling was impossible	0.1 to 0.4	380	20	-	220	23	-	-	-
Comparative Example 2	Ti-10at%Nb	Melting/ Casting	Square Nb, added at a time	Unmelted Nb, slight crack during plastic working	5 to 40	280	30	-	220	30	-	-	-
Comparative Example 3	Ti-30at%Nb	Melting/ Casting	Square Nb, added at a time	Compositional deviation after melting	8 to 75	220	31	-	330	30	-	-	-
Comparative Example 4	Ti-30at%Nb	Powder metallurgy	Mixed powder	Processing resistant	29.8 to 30.1	1500	25	98	450	16	1.2	1200	Separation
Comparative Example 5	Ti-10at%Nb	Powder metallurgy	Alloy atomized powder	Processing resistant	9.9 to 10.1	800	15	98	420	10	1.0	350	Separation

Industrial Applicability

[0043] The embodiment of the present invention yields a superior effect of being able to suppress the generation of particles during sputtering, since the Ti-Nb alloy sputtering target of the embodiment of the present invention has a favorable surface texture with a low oxygen content and is readily processable due to its low-hardness. The embodiment of the present invention is beneficial as a Ti-Nb alloy sputtering target suitable for forming thin films for use in the device wiring of a semiconductor integrated circuit.